

## Abstract

### THE DEPARTMENT OF ENERGY'S AUTOMOTIVE ALTERNATIVE FUELS R&D PROGRAM

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The Alternative Fuels Program is aimed at reducing U.S. dependence on foreign oil and improving air quality by developing and demonstrating engine/fuel technology that allows alternative fuels to supply a significant portion of the Nation's transportation needs. The goal of the Automotive Alternative Fuel R&D Program is to "Conduct a research and development program to develop the necessary technology to allow alternative transportation fuels, engines, and vehicles to achieve similar cost, range, refueling, and acceptance to conventional gasoline vehicles. Development and demonstration of non-production vehicles are performed in a manner that will meet or exceed future emission standards and energy efficiency goals. Achieving this goal will translate into an investment in expanded alternative fuel production/processing facilities and the fuel/distribution infrastructure. This investment will reduce our trade deficit, improve our energy security, and create domestic jobs.

The major element within this program is the Alternative Fuel Vehicle (AFV) Systems Program. AFV Systems focuses on engine optimization by realizing the potential advantages of alternative fuels and designing powerplants, emissions control systems, fuel storage systems, and other components specifically for alternative fuel vehicles. This program is focused on research and development activities to advance the state of technology in light duty transportation alternative fuel use. The alternative fuels that are considered are compressed natural gas, ethanol, dimethyl ether, propane, and methanol. The program has been primarily oriented around applications of alternative fuels for conventional light duty engines. The research scope has been developed around activities conducted by the U.S. automobile manufacturers so that the DOE sponsored work does not duplicate what the manufacturers are already doing, but complements their work by extending new technology applications beyond the immediate market opportunities. While recent program activities have been emphasizing conventional spark ignited engines, it is the intent of the program to integrate more fully with the hybrid electric and fuel cell programs within the Office of Advanced Automobile Technologies to assist with the introduction of alternative fuels.

Another important role of the alternative fuels program is to conduct R&D of the alternative fuels themselves to examine fuel quality issues and fuel standards as they relate to alternative fuels. Also, there may be a need to consider changes to the fuel composition which could make the fuel operate better in the different types of engines that are being developed.

Over the past year work has been focused in three areas; the development of integrated vehicles for alternative fuels, alcohol cold start technology developments, and gaseous fuel storage system improvements. In the area of vehicle development, ULEV propane (IMPCO Technologies) and

ethanol vehicles (Southwest Research Institute) have been developed and are to be demonstrated this year. Work on the compressed natural gas integrated storage system (Johns Hopkins University) to be installed on a Chrysler Breeze is continuing and should result in a completed vehicle next year.

In the area of alcohol cold start technologies four different projects are continuing and will provide results this year. The projects include a rich combustion cold-start device by the University of Tennessee, partial oxidation reactor for improved cold-start by Arthur D. Little, generation of ethyl ether in an ethanol vehicle by the Colorado School of Mines, and an enhanced ignition system by Nexum Research Corporation.

Gaseous fuel storage projects include a low cost conformable LPG storage by Thiokol and the integrated storage system for CNG vehicles by Johns Hopkins University and Lincoln Composites.

In the future, the Alternative Fuels R&D program will continue to address the barriers associated with the introduction of alternative fuels. Specifically, light-weight low-cost CNG tank development, advanced CNG refueling station development, cold/hot start performance, and increased range and enhanced fuel efficiency of alternative fuel vehicles will be addressed. In addition, fuel system integrity improvements and fuel cost, quality and standards will be emphasized. Since dimethyl ether (DME) is a relatively new fuel in the program, an assessment of its safety, environmental benefits and economic impacts will be performed. The production, distribution and refueling infrastructure of DME will also be studied. In addition, research and development will be conducted on fuel injection, fuel storage and engines to make DME commercially viable.